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FIRE MANAGEMENT CONSIDERATIONS FOR REGION 1 WILDERNESS AREAS

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Statement of Intent

The intent of this paper is to examine various problems that may be encountered by the fire manager when an attempt is made to reintroduce fire for ecological reasons to the wilderness areas of Region 1, U. S. Forest Service. The material for this paper is drawn from a review of pertinent literature, interviews with prominent wilderness researchers and fire managers, and personal experience.

INTRODUCTION

Region 1 of the U. S. F. S. contains over 3.1 million acres of land classified as Wilderness or Primitive under the Wilderness Act of 1964. An additional 1.2 million acres is considered de facto wilderness and may be included in the Wilderness Preservation System at a future date.

The presence of wildfire for countless eons in these wilderness areas has been well documented. Carbon-14 dating of ancient charcoal in soil profiles indicates wildfire was a frequent visitor to our prehistoric forests.

Scars on ancient trees denote more recent visitation by fire. Early day fires were observed and recorded by many writers (16, 23, 26). Over the past sixty years, an effective system of fire suppression has led to the virtual exclusion of fire from wilderness areas of Region 1.

More recently however, research has led to the the realization that, not only is fire a natural agent in the forests, but it exerts a powerful force on the development of wilderness ecosystems. Komarek (22) states "before the coming of man to North America the fauna and flora constituted a Fire mosaic of great diversity created and maintained by lightning-caused fires along with other climatic and physical factors in the environment." In view of this realization, and in keeping with the spirit of the Wilderness Act, the Forest Service has decided to permit fire "to more nearly assume its natural role" within the wilderness areas of Region 1 (32). The return of fire to the wilderness environment may be one of the most challenging undertakings ever attempted by the fire organization of the Forest Service.

DETERMINING THE ROLE OF FIRE

The fire ecologist, working closely with the fire manager, and assisted by many other disciplines, must accurately determine the role of fire in the wilderness areas of Region 1. Although actual studies of fire ecology

in Region 1 are few, much can be learned from studies conducted in other parts of the country. Weaver (37, 38, 39, 40, 41) has studied extensively the role of fire in ponderosa pine stands throughout the west. Biswell and Kilgore (7, 8, 9, 15) have pioneered work in the sequoia region of California. Vogl's work in Wisconsin is well recognized (33, 34). Komarek (17, 18, 19, 20, 21, 22) is one of the foremost fire ecology authorities in the southeast. Finally, the Australians have recognized the ecological role of fire (13).

Studies conducted in Region 1 include the preliminary work of Gabriel (11) in the Bob Marshall Wilderness and the current White Cap Study (1). The White Cap Wilderness Fire Study will attempt to determine relationships between wilderness ecosystems and fire.

Although much emphasis is placed on determining the frequency of historic fires, I feel that a determination of the intensity of past fires is paramount to an understanding of the true role of fire. A great deal has been written about the intensity of ancient fires in other areas of the country. In some cases, valid comparisons may be drawn between these fires and Region 1 fires.

The majority of literature concerns areas with a history of frequent low intensity fires. John Muir (26) in his famous reference to the fires of the Sierra forests

describes the flames "creeping and spreading beneath the trees slowly nibbling . . . with flames an inch high, rising here and there to a foot or two . . . fires seldom or never sweep over the trees . . . they creep from tree to tree with tranquil deliberation." Kilgore (15), describing early fires in the sequoia groves, states "Periodic lightning fires reduced the amounts of ground fuels and understory vegetation in a way that decreased the chance of catastrophic fire and [sic] as such, fires were rarely hot enough to kill mature sequoias with their thick bark and tenacity for life." Biswell (7) believes that in the primitive sequoia forests small fuel accumulations that resulted from natural forest development were consumed by lightning fires which reduced the fire danger (hazard) to a tolerable level so that all-embracing fires were unknown.

Wagner (36) conducted studies which agreed with the findings of Show and Kotok (28) who concluded that extensive fires had occurred at intervals of 3-11 years or at a general average periodicity of eight years in the mixed conifer forests of central and northern California. Keen (14) reports that a ponderosa pine dating back to 1255 was cat faced by a fire in 1481, subsequently weathering 25 fires at an average interval of 18 years until it was cut in 1936. In 1951 Weaver (38) completed an examination

of ponderosa pines in the southwest which revealed scars indicating fires from 1708 to 1943 with intervals between fires ranging from 5-12 years.

The many fires apparently endured by these veteran trees and their adaptation of a thick, fire resistant bark indicate that, over the centuries, light surface fires have probably been the rule in stands of sequoia and ponderosa pine. Another factor indicating frequent fires in ponderosa pine stands is their affinity for south and west facing slopes. South and west slopes have a higher percentage of fire incidence and a higher percentage of large fires than do other slopes (4). It is well known among fire control specialists that ponderosa pine stands have a longer fire season than other stands in the same area.

Historically, fire frequency and intensity in Region 1 ponderosa pine and larch stands was probably very similar to frequencies and intensities indicated by Weaver's work in Washington, Oregon, and Arizona. However, I feel that the majority of area burned annually in other timber types within Region 1 was burned by infrequent fires of high intensity.

The evidence supporting the presence of widespread intense fires in Region 1 is heavy. Muir's description of the Sierra fires also contained an indirect reference

to the Rockies--"Fires seldom or never sweep over the trees in broad all-embracing sheets as they do in the dense Rocky Mountain woods" (26). Leiberg (23) mentioned the intense nature of northern Rocky Mountain fires. "The forest fires in this region are remarkable for their destructive force and intensity. Here and there are uneven aged stands, where extremes in age and a mixed composition prove that occasionally the fires did not consume or kill the entire stand. But as a rule most of the older fires made a clean sweep. . . ." Wellner (42) also supports the theory that catastrophic fires, rather than creeping surface fires, have characterized wildfire in the northern Rocky Mountains.

Research conducted in fuel types similar to Region 1 has described high intensity fires. Maissurow (24), in a study of fire in the white pine lands of Quebec, concluded that ordinary forest fires of the past were almost as destructive as the fires of 1920-30. (Fires in Quebec during this period were given impetus by large accumulations of logging slash.)

During the period 1893-1937 in excess of 6.1 million acres in interior Alaska were burned by just 19 individual fires (3). Some of these fires were probably a product of the merger of several small fires and some may have been man-caused. At any rate, the vast area

burned indicates a great potential for naturally occurring high intensity fires.

A brief look at the adaptation of different species to fire may shed some light on the question of fire intensity. In certain species, individual plant survival is important to the survival of the species. Longleaf pine, for example, possesses thick fire resistant bark and is blessed with seedlings that are remarkably fire resistant. Ponderosa pine, larch, and sequoias also possess thick fire resistant bark. Individual trees of these species are adapted to survive low intensity fires but usually perish in a high intensity fire.

On the other hand, even though the individuals of such species as lodgepole pine, Douglas fir, and chamise usually do not survive an intense fire, the species is perpetuated by fire. These species are actually adapted to intense fires and competition is eliminated by temporary self destruction. Mutch (27) hypothesised that fire dependent plant communities burn more readily than non-fire-dependent communities because natural selection has favored development of characteristics that make them more flammable. If this hypothesis is accepted, it is then not difficult to speculate that among the fire adapted species, some are adapted to low intensity fires while others are favored by high intensity fires. Komarek

(22) states "the black spruce and the white spruce are fire adapted trees, but unfortunately are adapted to catastrophic fires primarily for regeneration purposes." With the exception of ponderosa pine and larch, I feel that the majority of Region 1 forests have adapted to periodic high intensity fires.

Dating of fire scars in veteran trees that have survived repeated burns is one widely accepted method of determining fire frequency. However, fire scars may not be indicative of the intensity of past fires. A veteran that has survived several fires is thought by many to be an indication of low intensity burns since, obviously, the veteran would not have survived a high intensity fire. There is some weakness in this assumption. Some trees survive even the most intense fires due to vagaries of fire behavior. The oldest veterans found by Gabriel (11) were located in creek bottoms or high on rocky ridges where they would have been afforded some degree of protection from intense fires. If, for example, an intense fire burned a stand of 100,000 trees and only ten per cent survived, four more fires, each consuming 90 per cent of the remaining veterans, could sweep the stand. Mathmatically, one tree that had weathered five intense fires would remain. The assumption that the periodic fires that visited this tree were of low intensity would be invalid.

It should be remembered that many fire scar studies cite only single trees, or, at best, a dozen trees as examples.

Further insight as to the intensity of Region 1 fires can be gained from an analysis of fire records. The majority of fires occur in Region 1 from early July to early September. This is also the time when fires have the greatest tendency to become large. Generally, if weather conditions are present that will permit rapid surface spread in a Douglas fir or lodgepole stand, these same conditions may well produce crown fires.

Pre and post fire season fires probably did not account for a significant portion of the total burned area. The few fires that occurred during the early part of the season (May and June) were usually extinguished by June rains or smouldered until conditions were more conducive to rapid spread. An analysis of 212 fires occurring from 1926 through 1970 in the White Cap drainage of the Selway-Bitterroot Wilderness revealed that, during May and June, only 3 fires reached a size of ten acres or more (1). Fires occurring after the September rains had diminished the fire danger probably smouldered or crept slowly until they were extinguished by fall rains or snow.

The Sundance fire provides my final example to illustrate the point that the majority of acreage was probably burned by crown fires. This crown fire covered

more territory (50,000 acres) in nine hours than all fires combined covered in Region 1 during the preceeding five years (2, 30).

If fire is permitted to return in any significant degree to wilderness areas of Region 1, the fire manager must expect high intensity crown fires and base his plans accordingly.

Any discussion of fires' role in wilderness eventually leads to a mention of the fuel build-up theory. The theory states that sixty years of effective fire suppression has resulted in a build-up of natural fuels which makes the forests prone to wildfires that are more destructive than the fires which occurred in the past (6). This theory warrants discussion for two reasons. First, if the theory is true, then this accumulation of fuel should pose a problem for the fire manager attempting reintroduction of fire in a wilderness area. Second, no actual proof exists as to the authenticity of this theory (42).[1]

There seems to be a tendency to oversimplify the

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[1]Weaver's work in Oregon has produced strong evidence that excluding fire from ponderosa pine stands with a historic fire frequency of 8-12 years does produce fire of higher intensity when the stand finally burns (39, 40, 41). Excluding fire from Region 1 ponderosa pine may well have the same effects as those reported by Weaver. However, care should be exercised in comparing Weaver's results to other timber types.

fuel build-up theory. I call this oversimplified version of the theory the Fuel Monster Bogy Man. Believers in the Fuel Monster often blame the Sleeping Child (Mine) and Sundance fires on a build-up of fuels due to fire exclusion. It is my contention that fires of this magnitude would still occur even if suppression had never been practiced in Region 1.

In support of this statement I would like to discuss the nature of forest fuels. Any fire is a function of weather and fuel. Any major wildland fire is a function of available fuel and adverse weather. Fuel for a forest fire is derived from the biomass that is produced by the photosynthetic process. In some stands this biomass may amount to 300 tons per acre. However, this 300 tons of fuel is not the critical consideration in determination of fire spread or intensity. It is the available fuel, coupled with the weather, that determines fire intensity. Available fuel is defined as the fuel that is consumed by the moving flame front, that actually contributes energy to the thermal pulse of the front. Studies have shown that a fast moving fire consumes only that material less than one half inch in diameter during passage of the front (10). Larger fuel is consumed after passage of the front and does not contribute to the thermal pulse. Countryman (10) has shown that 60 per cent of the chamise

plant, a major component of the notorious southern California chaparall, is composed of material less than one half inch in diameter. This fact, coupled with the chemical composition of the plant, is why chamise is one of the most flammable of all wildland fuels. A study of the Sundance fire revealed that fuel involved in the fire front consisted of foliage less than one eighth inch in diameter, brush less than one quarter inch in diameter, and only twenty per cent of the ground litter (2). From tables in this study it can be calculated that only 10 tons of fuel per acre contributed to the fire front.

With proper weather intense fires can occur with less than six tons of available fuel per acre. The Australians have recognized this and strive to keep their available fuel below six tons per acre with prescribed burns every four to six years (13).

It is likely that available fuel builds up rapidly following a destructive fire to a point where another major fire can be supported. This build-up may take as little as ten years as evidenced by the reburns cited in Gabriel's work (11). The Australians feel their available fuel reaches a maximum somewhere around twenty years (13). By use of fire scar dating Gabriel determined the perimeter of a large fire in the Bob Marshall Wilderness that burned in 1844. His data also shows that large portions

of this original burn were reburned in 1854, 1889, 1895, 1910, and 1919. Although his data for earlier fires is sketchy, it is likely that the area also burned four times in the 100 years preceeding the 1844 burn. The presence of naturally occurring wildfires in this study area certainly did not eliminate the possibility of large burns. It is likely that once available fuel has accumulated to a point where it will support an intense fire, farther fire exclusion does not make the area more prone to catastrophic fires, it merely causes an accumulation of more biomass.

Wellner (42) feels that fire protection per se has actually improved the overall fire situation by reducing the area of high hazard recent single burns and by maintaining less hazardous green forests. Gabriel's study also seems to indicate that fire breeds fire. The classic example of fire breeding fire is the Tillamook fire of 1933. This burn, which destroyed more standing timber than any fire in history, was revisited every six years until 1948 by destructive fires. Significant areas of the 1910 fires in Idaho and Montana reburned in 1919, 1926, and 1934. Much of the Sleeping Child burn, only eleven years after the fire, consists of extensive snag patches with dense reproduction that could be swept again by crown fire.

I conclude that when fire is reintroduced to Region 1 wilderness areas it must be intense if it is to accomplish its natural role. Furthermore, any build-up of available fuel that has resulted from sixty years of fire exclusion will not be significantly greater than the maximum amount that often accumulated naturally prior to protection. The return of fire to the wilderness will not prevent successive large fires from occurring in the future.

OBSTACLES TO THE INTRODUCTION OF FIRE

Once the role of fire in wilderness ecology has been properly determined, certain obstacles to the introduction of fire must be considered. These obstacles may be economic, psychological, legal, administrative or technological in nature. Later I will discuss four methods of fire introduction. Each method will be confronted to varying degrees by the following obstacles:

In service attitude
Public safety
Potential damage to outside resources
Air quality legislation
Economic restrictions
Public attitude

I have determined from personal experience and discussions with various people that a certain amount of resistance to the idea of fire in the wilderness exists within the Forest Service. This resistance seems to be strongest at the ranger district level and probably stems from a combination of gut reaction against fire and a lack of information as to the ecological need for fire.

This resistance to wilderness fire apparently exists in other protection agencies (29). As an example, a questionnaire regarding attitudes toward wilderness fire was recently completed by 94 students at the National Fire

Generalship School conducted at Marana, Arizona (31). Students attending this school represent protection agencies throughout the country. Thirty three indicated preference for control of all wilderness fires as soon as possible whereas eleven were undecided as to what the policy should be.

A serious effort should be made to overcome this in service resistance. This can probably be done by thorough dissemination of information. Only when the members of the organization accept the idea can it be sold to the public.

Public safety is another factor that must be considered prior to the reintroduction of fire. As mentioned above, the degree that this issue will be a problem is directly proportional to the degree of fire introduction. On this particular issue I found a wide range of opinions among the people I interviewed but found no mention of it in the literature.

The spectrum of attitudes on the topic ranged from doubt as to whether it will be a problem at all to serious concern over the safety of the public. Some people felt the public would police itself by avoiding going fires and possibly not entering the area at all during exceptionally bad periods.

I am inclined to believe that even if all fires

were allowed to run their course, the threat to wilderness visitors would be small. Only the foolhardy would approach an obviously dangerous fire. Wildfires should probably be viewed in the same light as snake bite, bear attacks, or getting lost--it's a chance you take when you go in. Eventually, a wilderness visitor will be burned by a fire and the ruckus will probably be similar to that raised over the Glacier Park bear incident.

Unfortunately peak use of wilderness in Region 1 conincides with the peak of fire season. Any attempt to limit entry during all periods of high fire danger would have a significant impact on the availability of the area. Even if it is necessary to limit entry, I feel it should only be necessary for short periods during bad years or while a large fire is running.

Some attempt to caution visitors about the dangers of fire and how to avoid being trapped by one should probably be made. Information could be disseminated in much the same way as fire prevention information.

A major argument against the return of fire to the wilderness is the potential threat a free burning fire in the wilderness poses to outside resources. Any time fires are permitted to burn a certain amount of risk must be assumed. The more nearly fire is permitted to play its natural role, the greater the risk becomes.

The grim specter of a major holocast exploding out of a wilderness and into the world of commercial timber and private land will lurk in the minds of fire managers each time a large fire approaches the boundary. If, upon occasion, large fires burn too close to the boundary, a few panic buttons will probably be pushed and forces will be committed to a Maginot line defense. Attempting to stop a large fire on the wilderness boundary would be, in many areas, a difficult and costly venture.

One outside value that should be carefully considered is water quality. Under pristine conditions it did not matter if, due to a major fire, heavy amounts of silt and debris were carried downstream. In modern times, siltation of dams, damage to fish habitat, and impairment of water quality may regulate management decisions regarding certain watersheds. While I was in the army, I served as officer in charge of fire suppression on a 176,000 acre military post in California. For many years it was the practice on the post to burn nearly 8,000 acres per year for hazard reduction. Recently this practice was sharply curtailed due to siltation of two dams located several miles downstream from the post. Although soil types, precipitation patterns, fire frequencies, and cover types are different from those in

Region 1, the same problem may arise in Region 1 if extensive areas of wilderness are allowed to burn.

Air quality legislation is perhaps the most omnious obstacle to the whole concept of wilderness fire. The possibility is very real that legislation founded on emotion rather than fact could be passed which would make the question of wilderness fire academic. As evidenced by frequent news articles the public does not look favorably on smoke from any source. Quoting from an Oct. 19, 1971 editorial in the Ravalli Republican--"Next time, however, it would be wise to issue a leaf-burning edict for everyone in the valley, not just in Hamilton. It's to be hoped the Forest Service will figure out a way to eliminate slash burning, and soon." The editor obviously either did not understand or did not accept the difference between low elevation smudge fires and well managed, high elevation, intense slash fires. The quotation epitomizes the attitude of many people regarding smoke from any source.

Certain differences do exist between slash fires and wilderness fires. Slash fires can frequently be seen from population areas whereas many wilderness fires will be out of sight--out of mind. Wilderness fires will, on the average, be at a higher elevation than slash fires and this will facilitate smoke dispersal. On the negative

side though, free burning fires will span periods of good and poor dispersal. Even a high intensity wildfire can contribute considerable smoke to critical air sheds under certain conditions. According to Beaufait (6) a wildfire burning under unfavorable dispersal conditions may produce ten times as much particulate matter and unburned by-products as a well managed slash fire.

As an aside to the smoke issue, it may be interesting to note that length of visitor stay in Mount McKinley National Park, Alaska decreased significantly in 1969 as a result of reduced visibility due to extensive wildfires (25). Smoke may affect quality of wilderness experience, tourism in adjacent areas, air navigation, and detection of non-wilderness fires.

In order to avoid passage of emotionally based legislation and the creation of ill feelings such as that evidenced in the editorial quoted above, it will be necessary to convince the public that the project is not detrimental to air quality.

Like every management tool, financing will have to be provided for wilderness fire. Funding to complete pilot programs such as the White Cap study is necessary. Once the experimental phase is over, the amount of financing necessary to permit an on-going program will depend on the methods used and degree of fire introduction.

A certain savings in suppression expenditures should result from a let burn policy provided the panic button isn't pushed every time a fire gets larger than anticipated. Many small fires can be fought for the price of one large fire.

Although a savings in suppression monies represents a savings of tax dollars, a let burn policy may actually decrease the managerial potential of the administrative unit. If an administrative unit that contains a significant area of wilderness should lose part or all of its protection responsibility for the area, it can be assumed that regular fire funds and FFF would be decreased accordingly. The sizeable amount of nonfire related work accomplished on most units by personnel financed from FFF each summer would then be diminished.

Perhaps the most widespread obstacle to the idea of wilderness wildfire is adverse public opinion. The public has been conditioned for nearly sixty years to believe that any free burning fire is bad. In some instances, the anti-fire belief is nearly as sacred as patriotic beliefs.

Reintroduction of fire in any significant degree will require an extensive public education program to overcome anti-fire feelings. In these ecologically oriented times when public involvement is so important, it is imperative that the public understand the natural role of

fire. A well conducted information program will also serve as insurance against a backlash reaction if a fairly large tract should burn. Such a backlash could result in legislation that would endanger the entire wilderness wildfire program.

This information-education program will have to be initiated at the national level in order that Smokey Bear's image can be changed. Smokey's current image projects the idea that all fire is bad. This projection is imcompatible with the idea of free burning wilderness fires. The program will have to be conducted at all administrative levels in much the same manner as an intensive fire prevention campaign. Individual and small group contacts should be given high priority.

This program will be a delicate undertaking and should be conducted by persons well versed in the subject. It will be difficult for some people to understand why they are urged to be careful with their campfire or smoke when an unattended wildfire is in full view. It is conceivable that due to the inability of a few people to understand the concept of ecological fire the prevention program could suffer. An increase in man-caused fires both inside and outside the wilderness could be one consequence of an inadequate education effort.

Public confidence must be gained before wildfire

is reintroduced to the wilderness. The public must be confident that outside resources are safe from fire, that air quality will not be impaired and that wilderness fire is not "bad" but natural.

METHODS OF FIRE REINTRODUCTION

The obstacles to wilderness fire previously discussed will play a major role in determining the method of fire reintroduction. Governed to some extent by these obstacles, guided by research findings, and possibly limited by technical capability, fire will eventually be returned to the wilderness.

The spectrum of possibilities for returning fire is wide. At one end of the spectrum, only small, safe, lightning fires might be allowed to burn while at the other end all fires could be allowed to run their natural course. Prescribed fire could be used exclusively or in combination with wildfire. Eventually each wilderness area will probably be preplanned with varying degrees of fire permitted in each zone.

The most feasible method from an economic and technological standpoint is that of allowing small, safe fires to burn. The beauty of this method is that the decision making process for each fire can be reduced to a simple chart. At the district level the dispatcher can easily determine which fires are in the "let burn" category.

Such a chart is currently being used in Region 3, U. S. Forest Service. Any fire that occurs before or after the fire season is subjected to a set of selection criteria. Selection criteria include considerations of fire danger, potential resource damage, soil erosion, threat to improvements, method of financing, and ultimate suppression costs. After considering all these factors, a decision is made as to whether the fire can be allowed to burn under surveillance or will be suppressed immediately. Fires occurring during the fire season are suppressed immediately. By the time the pre and post season fires in Region 1 ran this decision gauntlet, only a few would be permitted to burn. This small number of fires burning under poor conditions for spread would only restore fire to an insignificant portion of the wilderness.

A system of preplanned zones in which fires will be permitted to burn at certain times of the year and under specified weather conditions is probably the best alternative. As an example, high elevation fires in sparse fuels surrounded by natural barriers could burn at any time and under all conditions of weather. Fires located in large continuous expanses of fuel leading up to the wilderness boundary might be permitted to burn only after the fire season.

With this method, stringent restrictions would

approximate the results obtained from using the first alternative--fire would play much less than its natural role. Lenient restrictions would permit fire to more nearly assume its natural role. Large fires would occasionally result under this system. Lenient restrictions would entail greater risk of escape fires and unacceptable quantities of smoke. The more lenient the restrictions, the more complex the decision making process becomes.

Preplanning each drainage or major zone within a wilderness with due consideration for the ecological goals and fire potential will be a major task. Determination of the specific weather conditions for each zone under which fires can be permitted to burn will likewise be a major task. Computer models based on records of fires in similar zones might be helpful. As experience is gained and the art of fire behavior becomes more sophisticated, larger fires can be permitted with little chance of escape.

At the far end of the spectrum of let burn possibilities all fires in the wilderness will be free to run their natural course. This would be the ideal method from an ecological standpoint.

If the estimated average natural periodicity of fire is 150 years, then, on an average year, about 25,000 acres of wilderness will burn if there is no attempt at

control. This is about the same acreage that is burned by slash fires each year. In easy years the figure would be much lower. During unusually severe years a few hundred thousand acres might burn. If the average of 25,000 could be held constant, this method might be acceptable. However, large fires would still have to be stopped at the wilderness boundary.

During severe years, it is likely that the same weather conditions which cause wilderness fires to become large would also cause fires outside the wilderness to grow large. Control forces would be over-committed in an attempt to stop wilderness fires at the boundary and, at the same time, cope with non-wilderness fires.

An extensive system of fuel breaks linking natural barriers around the perimeter of a wilderness will make this approach more feasible. Land exchanges and boundary adjustments will place perimeters in more favorable locations to control a fire escaping the wilderness area. The cost of establishing and maintaining such a system would be enormous and probably prohibitive. It is doubtful whether the "let 'em all go" approach will be feasible in the foreseeable future.

Prescribed fire offers another possibility for returning fire to the wilderness. Wildfires have historically burned at the whim of nature. Fire prescribed

at the whim of man may or may not approximate natural fire. Any use of prescribed fire should approximate natural fire, both in frequency and intensity. Several factors will make the use of prescribed fire in Region 1 wilderness a unique experience. Very little work has been done with prescribed fire under standing timber in Region 1. Proper application of fire to the wilderness will not be as simple as application of fire in the Southeast for hazard reduction or as burning for slash disposal in the West.

Hazard reduction burning in the Southeast is carried out under conditions of low fire danger. Control lines and sophisticated firing techniques are utilized to produce a well controlled low intensity fire. By contrast, wilderness prescribed fire should be applied under conditions of moderate-high fire danger to achieve a crown fire. Except for natural barriers, control lines will not be present. Terrain and dense vegetation will preclude sophisticated firing techniques.

Control lines, elaborate preparations, and sophisticated firing techniques also characterize western slash disposal fires. A slash disposal fire can be conducted when conditions in the surrounding timber are not very conducive to fire spread. Should a slash fire escape from its artificial fuel bed, it will likely burn into

timber where resistance to control and rate of spread are lower than in the slash. By contrast, a prescribed fire in the wilderness, should it escape, may burn into fuels with greater resistance to control and rate of spread. Prescriptions for wilderness fires may be much more difficult to formulate than those for brush disposal fires.

Early fall might be the optimum time for prescribed burning in the wilderness. Fires set earlier in the summer would pose an escape problem if adverse weather conditions developed. If the bottoms of several lateral canyons were ignited on a good day in mid-September, uphill runs hot enough to accomplish desired ecological purposes could be expected. By the time the fire topped out, the evening cool and the break in topography should quiet it considerably. Such a series of burns, located well inside the wilderness, would stand little chance of crossing the boundary. Fall rains would eventually extinguish the fires. There are many locations in the wilderness where sufficient natural barriers exist to permit the ignition of a hot, fairly large fire with little chance of escape.

A system in which selected natural fires are complemented by prescribed fires may enable man to meet nature half way on the wilderness fire ecology problem in a way that is both economically feasible and acceptable

to the public.

CONCLUSION

Intense wildfires have played a dominant role in shaping the ecological character of wilderness in Region 1. To perpetuate this character, fire will again have to assume its natural role. The public must understand and accept the concept of wilderness wildfire ecology. Once public acceptance is gained, the fire manager must then develop and implement a plan for returning fire to the wilderness environment.

LITERATURE CITED

1. Aldrich, David and Mutch, Robert W.
   1971. White Cap Wilderness Fire Study. A Progress Report Bitterroot National Forest, Hamilton, Montana

2. Anderson, Hal E.
   1968. Sundance Fire: An Analysis of Fire Phenomena Intermountain Forest & Range Experiment Station Research Paper INT-56

3. Barney, Richard J.
   1971. Wildfires in Alaska--some historical and projected effects and aspects. Proceedings, Fire in the Northern Environment University of Alaska College, Fairbanks, Alaska. April 13-14, 1971

4. Barrows, J. S.
   1951. Fire Behavior in Northern Rocky Mountain Forests. Northern Rocky Mountain Forest and Range Experiment Station Paper No. 29

5. Beaufait, William R.
   1970. Forest Fire and the Environment. A slide preparation. Northern Forest Fire Laboratory, Missoula, Montana

6. _____
   1971. Fire and Smoke in Montana Forests. Montana Forest and Conservation Experiment Station School of Forestry, University of Montana, Missoula

7. Biswell, Harold H. and Weaver, Harold.
   Redwood Mountain, American Forests, Aug. 1968 pp. 20-25.

8. _____
   1967. Forest fire in perspective. Proc. Cal Tall Timbers Fire Ecol. Conf. Tall Timber Res. Sta., Tallahassee, Fla. pp. 43-63.

9. _____ 1970. Ponderosa pine management with fire as a tool. Proceedings. The Role of Fire in the Intermountain West. Oct.-1970. Missoula, Mont. pp. 130-136.

10. Countryman, Clive M. and Philpot, Charles W. 1970. Physical characteristics of chamise as a wildland fuel. USDA Forest Service Research Paper PSW 66/1970.

11. Gabriel, H. W. 1969. Wilderness ecology of the Bob Marshall Wilderness area. Forest Service Project No. FS-INT-1903.

12. Harrison, George H. 1969. After the fire. Reprint from Nat'l Wildlife. 1969. 7(2) p. 36.

13. Hodgson, A. 1967. Fire management in eucalypt forest. Proceedings 6th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 97-111.

14. Keen, F. P. 1937. Longevity of ponderosa pine. Jour. Forestry 38: 597-598.

15. Kilgore, Bruce M. 1970. Research needed for an action program of restoring fire to giant sequoias. Proceedings. The Role of Fire in the Intermountain West. Oct. 1970. Missoula, Mont. pp. 172-180.

16. Koch, Elers. 1942. History of the 1910 forest fires in Idaho and western Montana. Reprint from Forest Service Files, Bitterroot Nat'l. Forest.

17. Komarek, E. V., Sr. 1965. Fire ecology--grasslands and man. Proc. 4th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 169-220.

18. _____ 1966. The meteorological basis for fire ecology. Proc. 5th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 85-125.

19. _____ 1967. Fire--and the ecology of man. Proc. 6th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 143-170.

20. _____ 1967. The nature of lightning fires. Proc. Calif. Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 5-41.

21. _____ 1970. Controlled burning and air pollution: an ecological review. Proc. 10th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 141-173.

22. _____ 1971. Principles of fire ecology and fire management in relation to the Alaskan environment. Proceedings. Fire in the Northern Environment. Fairbanks, Ala., April 13-14, 1971.

23. Leiberg, John B.
1899. Bitterroot forest reserve. Nineteenth Annual Report. U. S. Geol. Surv. Part V, Forest Reserves.

24. Maissurow, D. K.
1935. Fire as a necessary factor in the perpetuation of white pine. Jour. Forestry. 33(4) 373-378.

25. Miller, Ivan D.
1971. Effects of forest fire smoke on tourism in Mount McKinley Nat'l Park, Ala. Proceedings. Fire in the Northern Environment. Fairbanks, Ala. April 13-14, 1971 pp. 83-85.

26. Muir, John.
1901. Our national parks. Houghton Mifflin, Co. Boston and New York.

27. Mutch, Robert W.
1970. Wildland fires and ecosystems--a hypothesis. Ecology Vol. 51 No. 6. Autumn 1970. pp. 1046-1051.

28. Show, S. B. and E. I. Kotok.
1924. The role of fire in the California pine forests. U.S.D.A. Bull. No. 1294, 80 pp.

29. Trosper, Thurman H.
1971. Institutional barriers in fire management. Proceedings. The Role of Fire in the Intermountain West. Oct. 1971. Missoula, Mont. pp. 162-166.

30. U. S. D. A.
1969. Forest Service. Division of Fire Control, Northern Region. Forest Fire Records.

31. U. S. D. A.
1971. Forest Service Wilderness Study. Author unknown.

32. U. S. D. A.
1971. Forest Service Manual Section 5100.

33. Vogl, Richard J.
1969. Comments on controlled burning. Proc. 9th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta., Tallahassee, Fla. pp. 1-4.

34. _____
1970. Fire in the northern Wisconsin Pine barrens. Proc. 10th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 175-209.

35. _____
1971. Fire and plant succession. Proceedings, The Role of Fire in the Intermountain West. Oct. 1971. Missoula, Mont. pp. 65-75.

36. Wagner, Willis W.
1961. Past wildfire incidence in the Sierra Nevada Forests. Jour. Forestry. 59: 734-747.

37. Weaver, Harold.
1943. Fire as an ecological and silivicultural factor in the ponderosa pine region of the Pacific Slope. Jour. Forestry 41: 7-14.

38. _____
1951. Fire as an ecological factor in the southwestern ponderosa pine forests. Jour. Forestry 49: 93-98.

39. _____
1959. Ecological changes in the ponderosa pine forests of the Warm Springs Indian Reservation in Oregon. Jour. Forestry 57: 15-20.

40. _____
1964. Fire and management problems in ponderosa pine. Proc. 3rd Annual Tall Timbers Fire Ecol. Conf., Tall Timbers Res. Sta., Tallahassee, Fla. pp. 61-79.

41. _____
1967. Fire and its relationship to ponderosa pine. Proc. Calif. Tall Timbers Fire Ecol. Conf., Tall Timbers Res. Sta., Tallahassee, Fla. pp. 127-149.

42. Wellner, Charles A.
1971. Fire history in the northern Rocky Mountains Proceedings. The Role of Fire in the Intermountain West. Oct. 27-28-29, 1971, Missoula, Mont. pp. 42-64.

INTERVIEWS

In ~~the~~ preparation for this paper interviews were conducted with the following:

Aldrich, Dave. Bitterroot N. F. Wilderness Fire Planner

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Beaufait, Bill. Regional staff--Silviculturist

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BIBLIOGRAPHY

1. Boardman, Walter S.
   1967. Wildfire and natural area preservation. Proc. 6th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 135-142.

2. Brackenbusch, A. P.
   1967. Fire in the wilderness. Reprint-Talk given at Wilderness Meeting, Great Falls, Mont. Jan. 1967.

3. _____
   1970. Cause for concern. Proceedings. The Role of Fire in the Intermountain West. Oct. 1970. Missoula, Mont. pp. 119-126.

4. Cayford, J. H.
   1970. The role of fire in the ecology and silviculture of jack pine. Proc. 10th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 221-244.

5. Cowan, Charles S.
   1961. The Enemy is Fire. Superior Publishing Co. Seattle, Wash.

6. Hagen, Cecil.
   1970. Fire in ecology. Spokesman Review Magazine. May 9, 1971.

7. Hartesveldt, R. J. and H. T. Harvey.
   1967. The fire ecology of sequoia regeneration. Proc. Calif. Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 65-67.

8. Hayes, G. L.
   1970. Impacts of fire use on forest ecosystems. Proceedings. The Role of fire in the Intermountain West. Oct. 1970. Missoula, Mont. pp. 99-118.

9. Heinselman, Miron L.
1970. The natural role of fire in northern conifer forests. Proceedings. The Role of Fire in the Intermountain West. Oct. 1970. Missoula, Mont. pp. 30-41.

10. _____ 1970. Restoring fire to the ecosystems of the Boundary Waters Canoe Area, Minnesota and to similar wilderness areas. Proc. 10th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 9-23.

11. _____ 1970. Preserving nature in forested wilderness areas and National Parks. Nat'l Parks and Cons. Magazine. Vol. 44, No. 276, Sept. 1970, p. 8.

12. Hendrickson, William H.
1970. Consideration of natural fire, variance in viewpoint. Proceedings. The Role of Fire in the Intermountain West. Oct. 27, 28, 29, 1970. Missoula, Montana. pp. 76-80.

13. Holbrook, Stewart H.
1960. Burning an Empire. The Story of American Forest Fires. The MacMillian Company. New York, 1960.

14. Hoffman, Joseph E.
1970. Fire in park management. Fire in the Northern Environment. Fairbanks, Alaska. April 13-14, 1971.

15. Kallander, Harry.
1969. Controlled burning on the Fort Apache Indian Reservation, Arizona. Proc. 9th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 241-250.

16. Martin, Robert E., Charles T. Cushwa, Robert L. Miller.
1969. Fire as a physical factor in wildland management. Proc. 9th Annual Tall Timbers Fire Ecol. Conf. Tall Timbers Res. Sta. Tallahassee, Fla. pp. 271-288.

17. Moore, W. R.
1970. Fire management in the northern Rockies. Proceedings. The Role of Fire in the Intermountain West. Oct. 1970. Missoula, Mont. pp. 167-171.

18. _____
1971. Forest management with air quality. Statement for Air Quality Workshop. Missoula, Mont. Dec. 14, 1971.

19. Mount, Tony.
1969. An Australian's impression of forest fire research in North America. Forestry Commission, Hobart, Aust.

20. Prasil, Richard G.
1971. National Park Service fire policy in National Parks and Monuments. Proceedings, Fire in the Northern Environment. Fairbanks, Alaska, April 13-14, 1971. pp. 79-81.

21. Roe, Arthur L., William R. Beaufait, Jack L. Lyon.
1971. Fire and forestry--a task force report. Missoula Chapter, Society of American Foresters. 23 pp.

22. Smith, J. Harry and R. C. Henderson.
1971. Impact of fire control practices on ecosystem development. Proceedings. The Role of Fire in the Intermountain West. 1971. Missoula, Mont. pp. 86-98.

23. Steele, Robert W.
1960. The role of forest fire in the Bob Marshall Wilderness Area. Mont. For. and Cons. Exp. Sta., School of Forestry. U. of Mont. 32 pp.

24. Taylor, Alan R.
1971. Lightning--agent of change in the forest ecosystem. Jour. Forestry 69: 476-480.

25. U. S. D. A.
1961. Board of Review, Sleeping Child Fire, Bitterroot National Forest Files.